Deploying Xserve RAID

Session 626

Deploying Xserve RAID

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Introduction

Apple addresses the IT mantra

- Storage needs are growing over 100% yearly
- Managing storage is becoming a full time job
- Storage classes reduce cost and complexity
- Configuration and planning is key to efficient deployments
- Storage costs must meet lower server costs

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- Xserve RAID offers highest density in a 3U rack space
- Fast deployment and easy to use tools reduce complexity
- Flexibility allows Xserve RAID to bridge classes
- There is no substitute for good old fashioned hard work
- Xserve RAID is a Value leader

What You'll Learn

- Introduction to Xserve RAID
- Speeds and feeds (Architecture Review)
- Applications of RAID in IT infrastructures
- Planning considerations
- Deployment and configurations
- Managing LUNs and performance tuning
- **Sneak Preview**

Intro to Xserve RAID

Xserve RAID

A revolutionary new RAID storage solution

- Massive capacity
- Advanced architecture for superior performance and data protection
- High-availability design
- Remote monitoring and management
- Industry-leading value

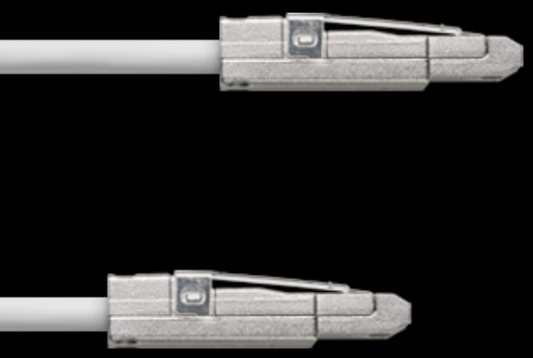
Designed for Nonstop Operation

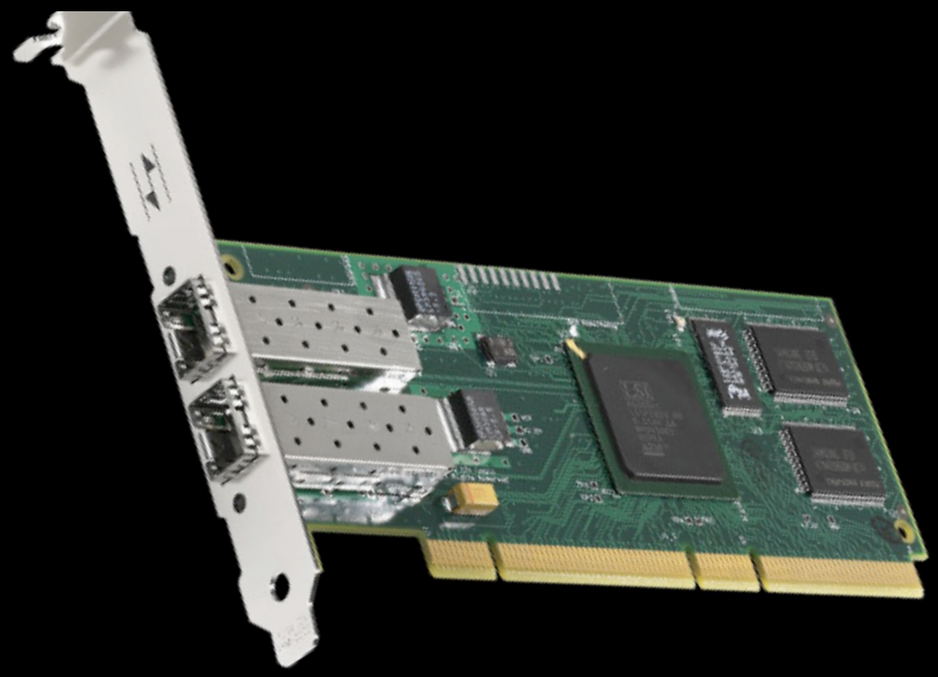
Superior data protection and availability

- Redundant load-sharing power and cooling modules
- Passive data path through midplane for superior reliability
- Global drive hot sparing

Complete Storage Solution

RAID and PCI FC Card





Not Just for the Rack

Deskside placement using an XtremeMac Xtrovert

Speeds and Feeds

Speeds and Feeds

Putting meaning to the numbers

- 14 independent drive channels
  - No interdrive dependencies
  - 1400 MB/s internal Bandwidth
  - Individual spinup/spindown control
  - Passive data path through midplane
  - Dedicated 64/66 PCI bus for drive communication
  - Events create less traffic on the PCI bus

Speeds and Feeds

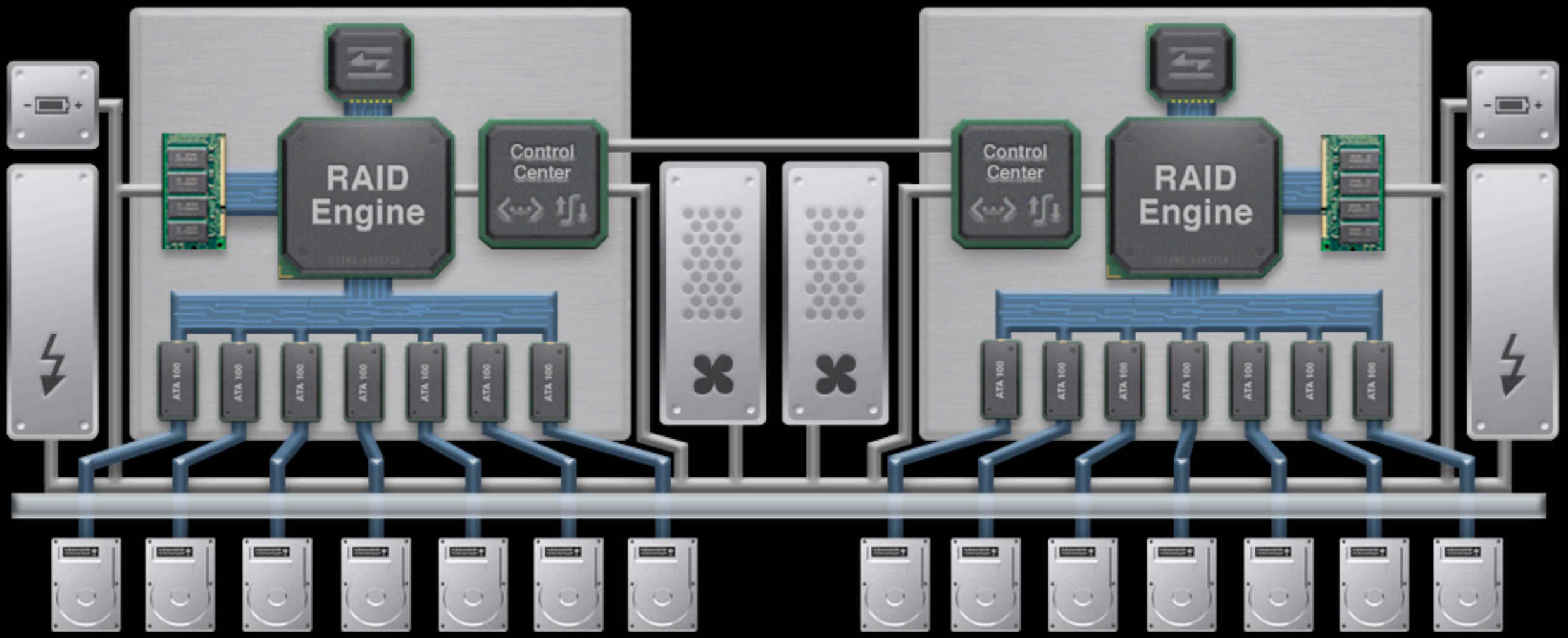
Putting meaning to the numbers

- Dual independent RAID controllers
  - Each controller manages only 7 hard drives
  - 512MB of “real” Cache per controller
  - Dynamic Cache scheme
    - Performance tuning is a combination of automatic and manual settings
  - Dedicated 2Gb Fibre port per controller
  - Management co-processor offloads enclosure management, RAID setup, and event logging functions

Speeds and Feeds
Megabytes and IOPS

- Throughput is a direct function of the complexity of the data being delivered
  - Optimized controller performs multiple XOR functions simultaneously, greatly increasing throughput in RAID 5
  - Dynamic prefetch and Cache scheme has finer grain manual control support
  - Proprietary caching scheme greatly increases IOPS
  - Use of Apple compound RAID levels take full advantage of dual independent controllers

Xserve RAID Architecture



RAID Applications in IT

RAID Applications

The uses for RAID are changing along with the requirements

- It used to be just about data protection
- It used to be too expensive
- It used to be too complicated
- It used to follow traditional views
- You may still follow the rules...

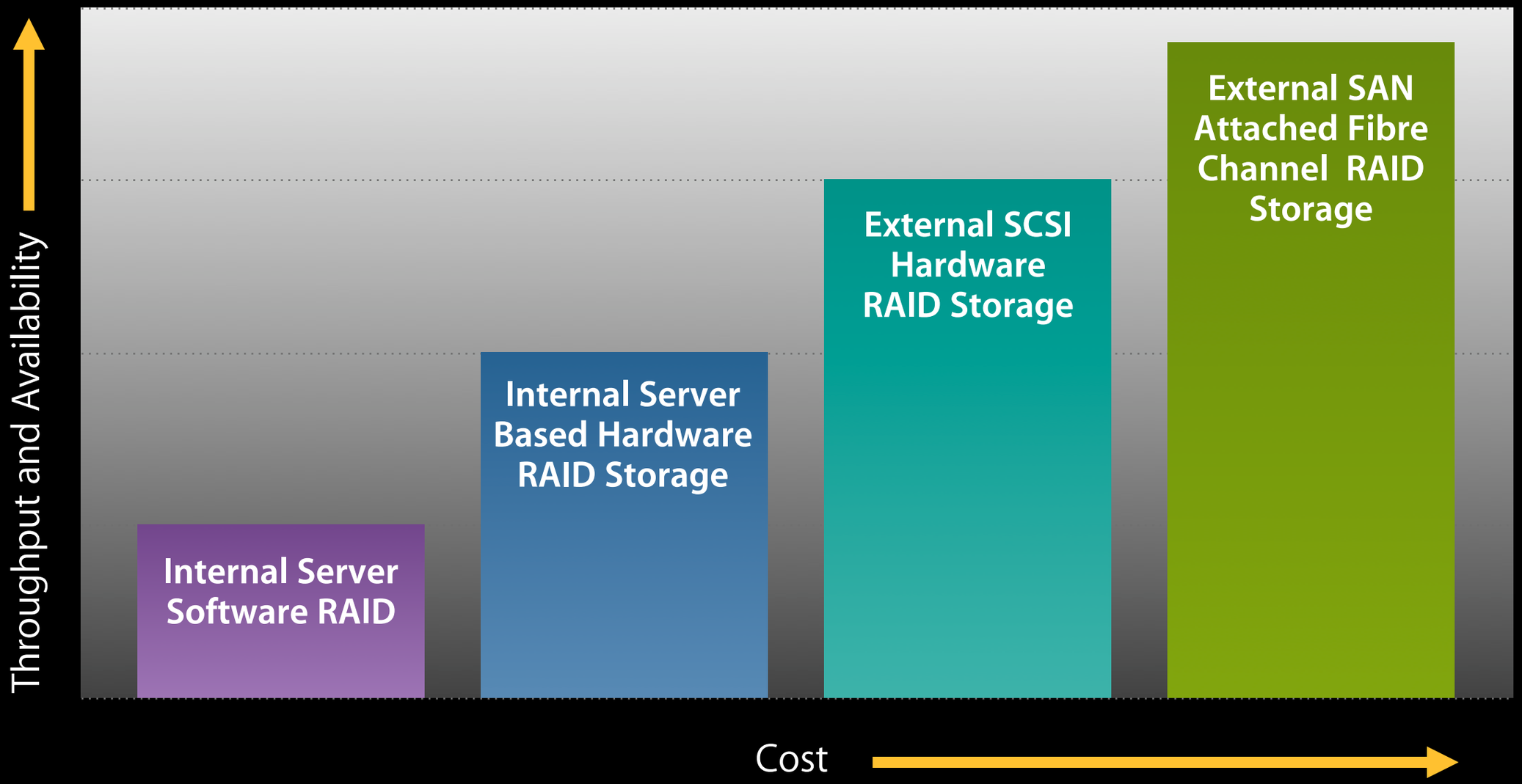
RAID Applications

Traditional Views on RAID

- Server based storage is best
  - It costs less
  - It's easier to deploy
  - My server vendor knows what's best for me
- Throughput is driven by cost
  - If it costs more it's faster
  - If it costs more it's better
  - If it costs more it's better supported

RAID Applications

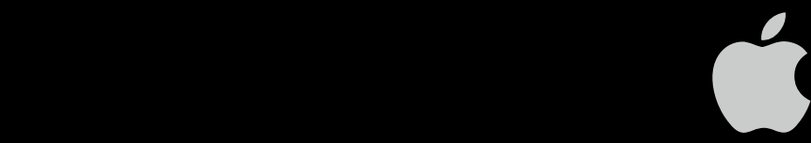
Traditional Views on Storage



RAID Applications

Storage Classes change the way we look at RAID

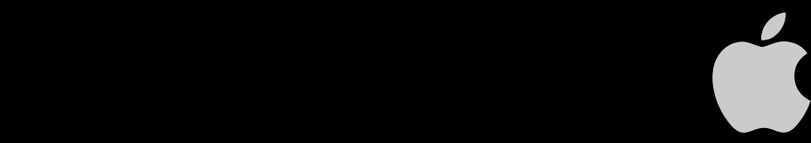
- Servers/applications are moving to a scale-out model
  - Servers have become more compact and of greater density—capacity and high availability features of dedicated storage are not practical
- As storage needs increase, the costs and management of dedicated storage become out of control
- Direct attach storage is no longer the only alternative
  - NAS and SAN deployments are nearing direct attach unit sales numbers



RAID Applications

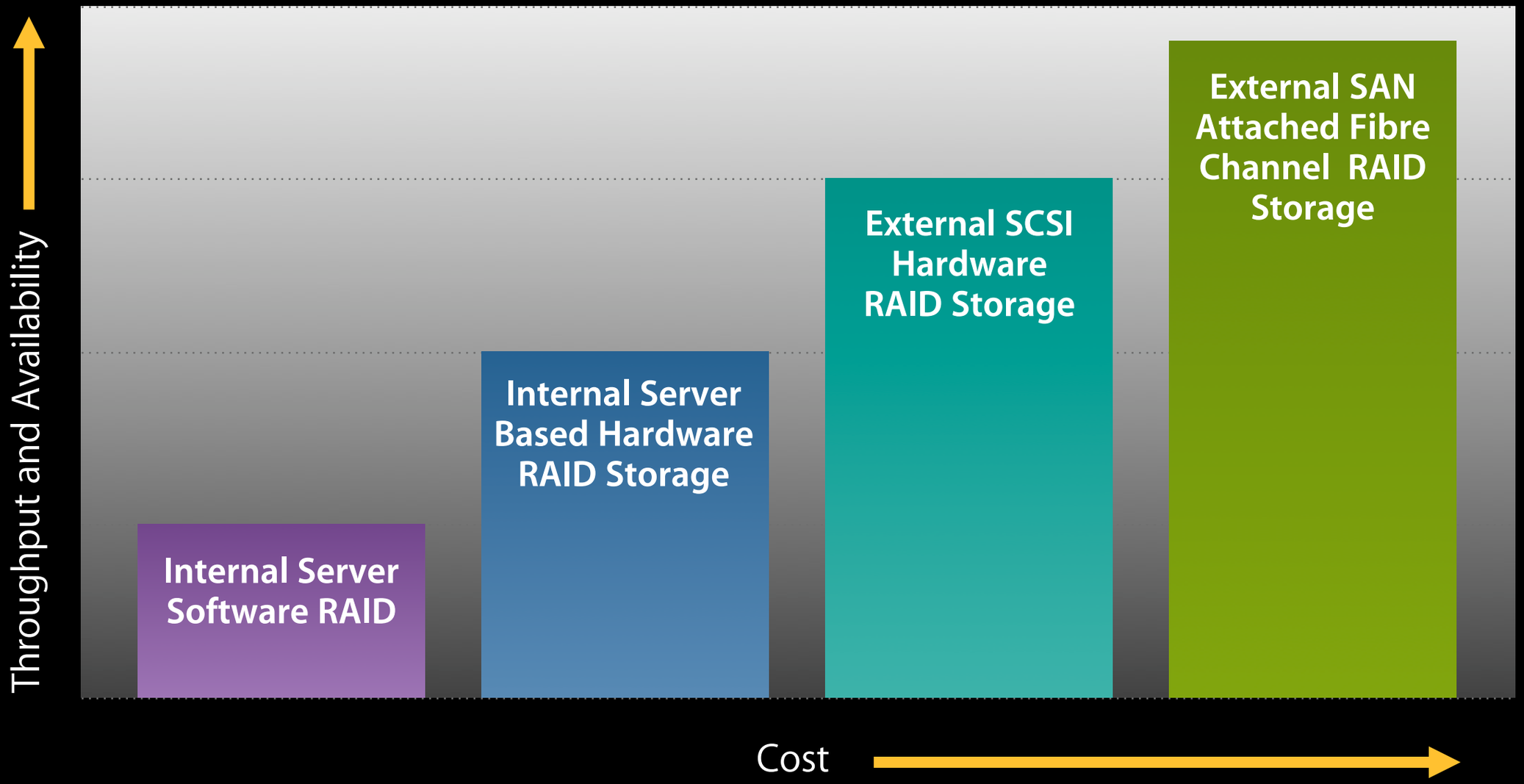
Storage Classes change the way we look at RAID

- As storage needs continue to grow, backup and archive windows are shrinking
- As more tapes and faster tape drives are required, the cost nearly exceeds the cost of disk storage
- Tape drive and media cost are not tracking with IT pricing patterns
- New ATA based storage offers high-end features and throughput at a much lower cost
- HSM was rediscovered and renamed “Near-Line Storage”



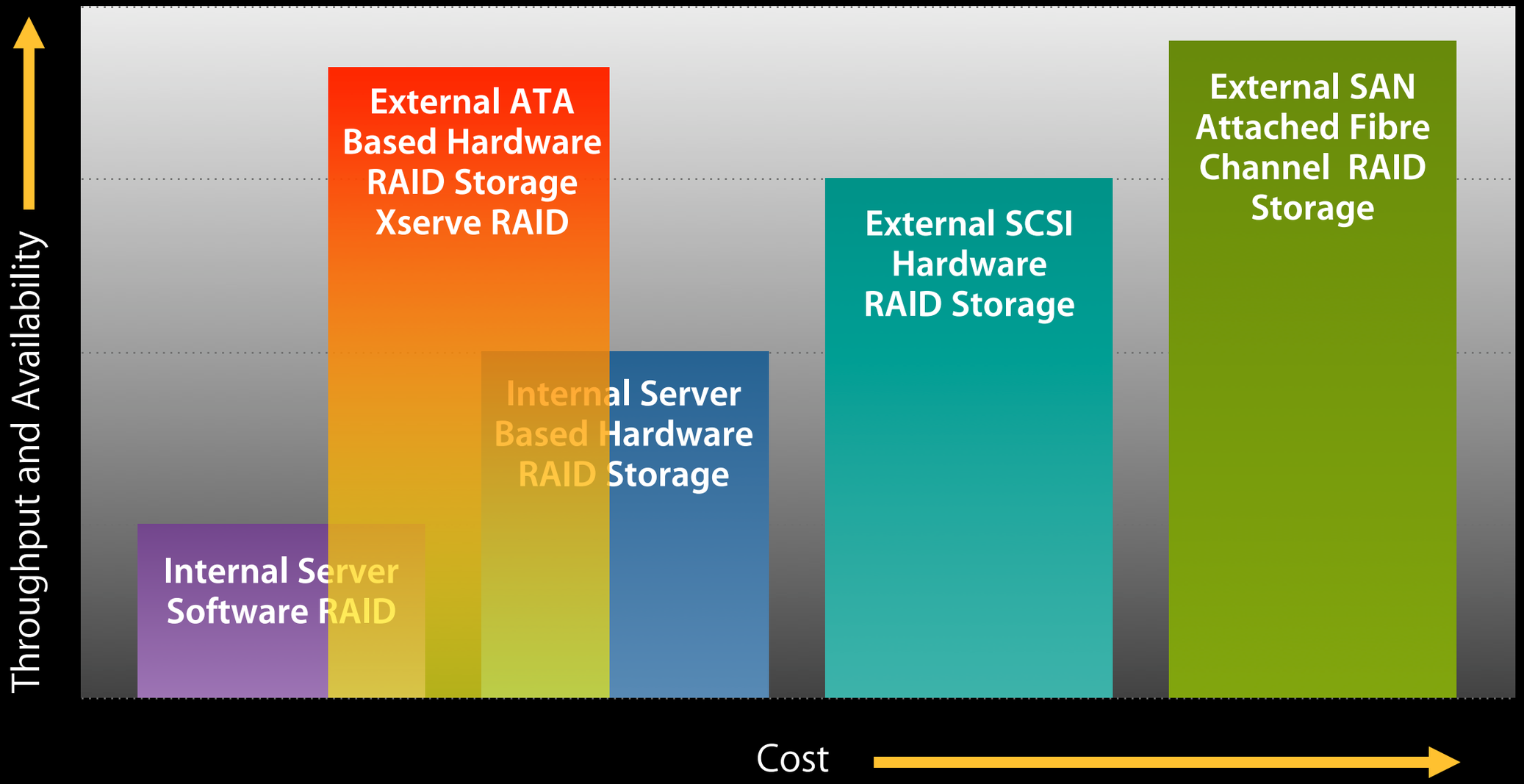
RAID Applications

Traditional views on storage



RAID Applications

Storage Classes change the way IT looks at RAID



Typical RAID Applications

Storage Classes change the way IT looks at RAID

- As more storage comes on line, backup and archive windows are shrinking
- As more tapes and faster tape drives are required, the cost nearly exceeds the cost of disk storage
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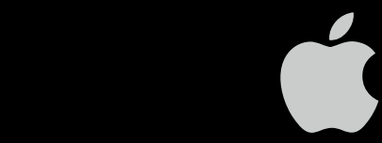


Typical Storage Classes

Storage Classes change the way IT looks at RAID

Class	
1	RAID 1, 3, 5, 6—Highly Available, Highly Redundant, Very Expensive
2	RAID 1, 3, 5—Business Critical Availability, Highly Redundant, Medium Cost
3	RAID 0, 1, JBOD—Low Cost, Risky

Typical Storage Classes

Storage Classes change the way IT looks at RAID

	Application	Class 1	Class 2	Class 3
Mission Critical	Enterprise Apps Data Base Financial etc.	On line Near line	Near line	
Business Critical	Business Apps Mail Server Calendaring	On line	On line Near line	Near line
	Business Apps E-commerce Web	On line	On line Near line	On line Near line

Planning

Storage Planning

Determining the correct solution

- Proper storage planning must take into consideration. . .
  - Capacity requirements
  - Throughput requirements
  - Availability requirements
  - Cost/value

Storage Planning

Determining the correct solution

- Capacity requirements
  - Today
  - Tomorrow
  - Scalability

Storage Planning

Determining the correct solution

- Throughput requirements
  - Application driven
    - IOPS or MB/s
  - Configuration driven
    - Dedicated storage
    - Shared storage
    - Network attached storage

Storage Planning

Determining the correct solution

- Availability requirements
  - Mission critical
    - No downtime
    - Business critical
      - Manageable downtime
  - Archive
  - Near Line

Storage Planning

Determining the correct solution

- Cost/value
  - Standard Metric $/GB—IDC published average for 2003 is ~$30/GB for ext. storage, currently XserveRAID is $4.36
  - Hidden costs
    - Infrastructure
    - Management software
    - Service contracts
    - Expansion costs

Deployments

Deployment Scenarios

Applications drive RAID deployments

- Apple Server
  - Single Server, Single RAID
  - Single Server, Multiple RAID
  - Multiple Servers, Single RAID
  - Multiple Servers, Multiple RAID

Deployment Scenarios

Applications drive RAID deployments

- Mixed OS/platform
  - Multiple Servers, Single RAID
  - Multiple Servers, Multiple RAID

Deployment Scenarios

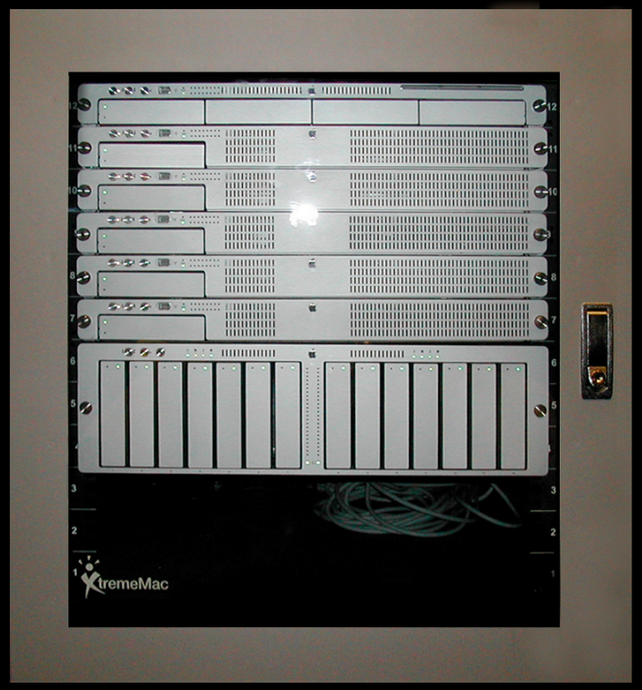
Applications drive RAID deployments

- Virtualized mixed platform
  - Multiple Servers, Multiple RAID

Let’s Build Some Scenarios

Typical Deployment Scenarios

It's all about getting the details correct



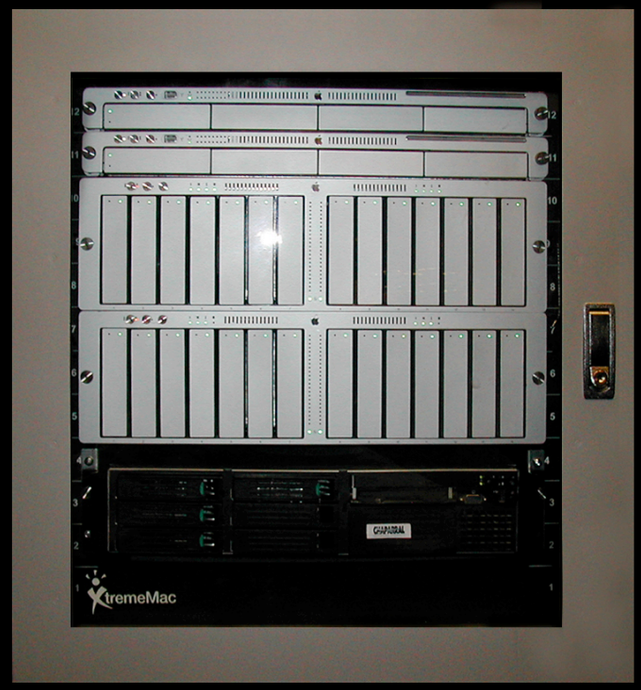
Scenario 1 and 2

Mac OS X Server
Xserve
Xserve RAID

Two Xserves
Xserve RAID

Scenario 3

Mixed Platform
Xserve
Win 2000 Server
Sun Server
Single Xserve RAID



Scenario 4

Virtualized SAN
Chaparral Radar PS
4 Xserves
Two Xserve RAIDs

Xserve RAID Components

Xserve RAID

Front panel provides visual feedback

Enclosure lock

System identifier button

Alarm silencer

System status indicators

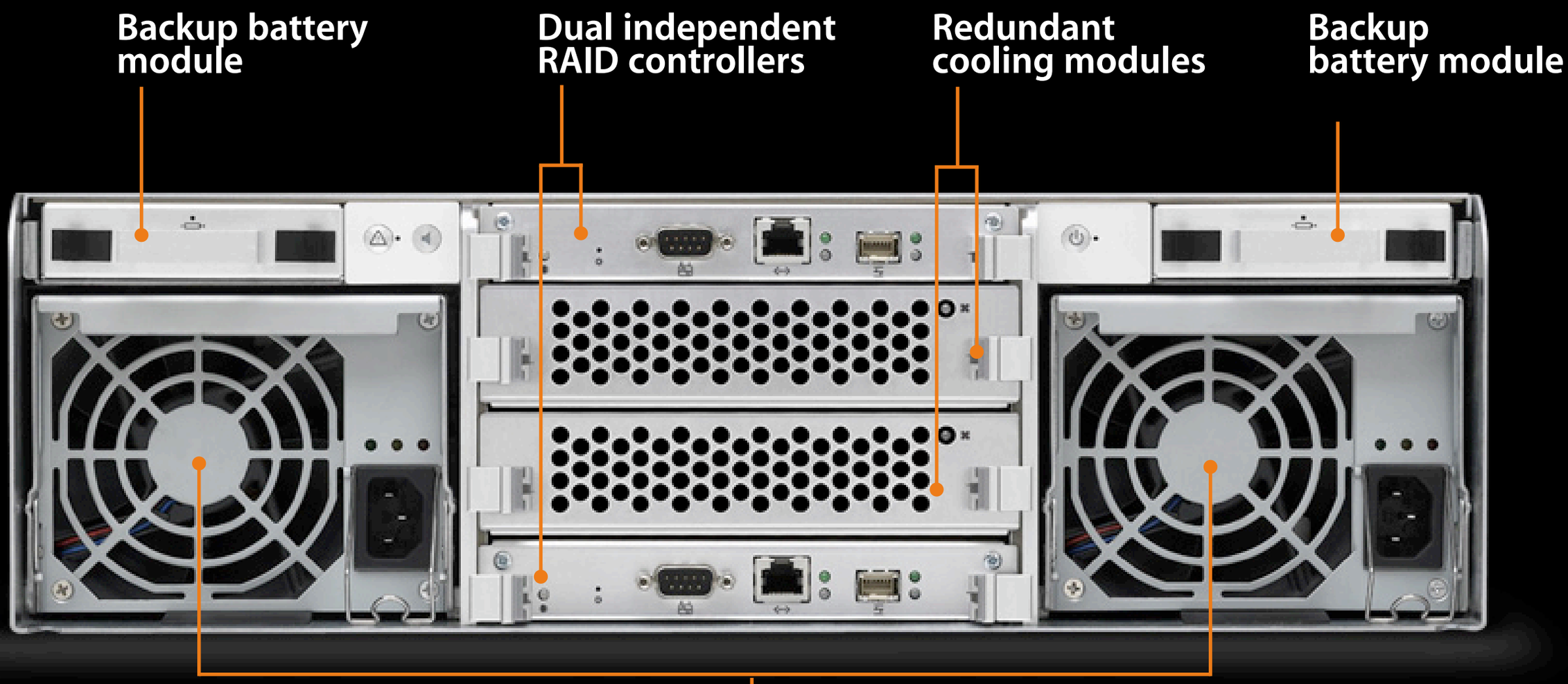
Drive activity and health indicators

Fibre Channel link indicators

Fibre Channel activity

Xserve RAID

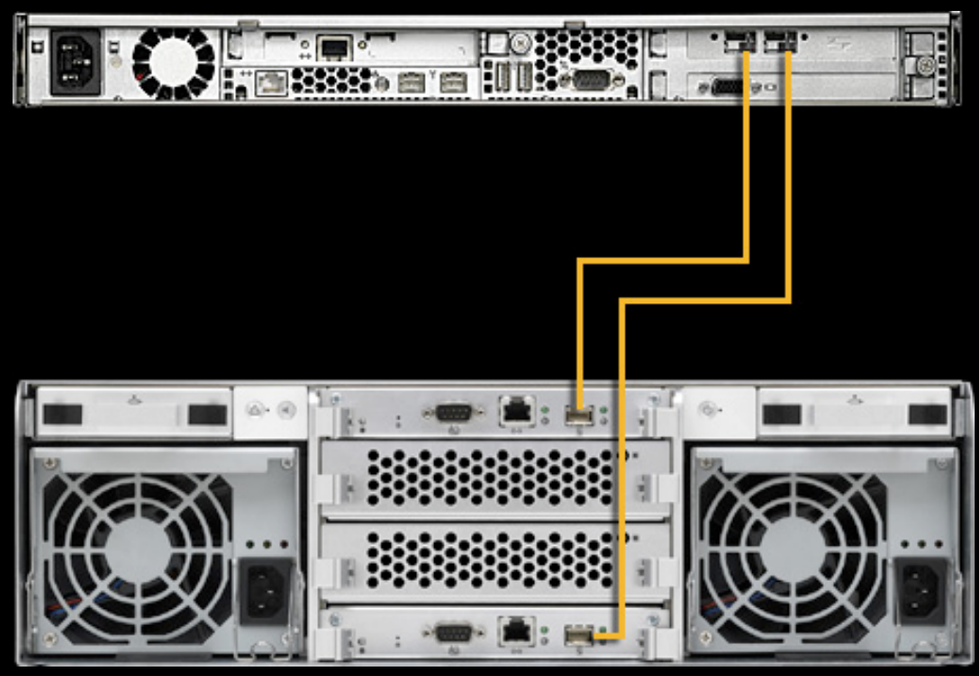
Back panel provides easy access to components



Scenario One—SOP

How did we do it?

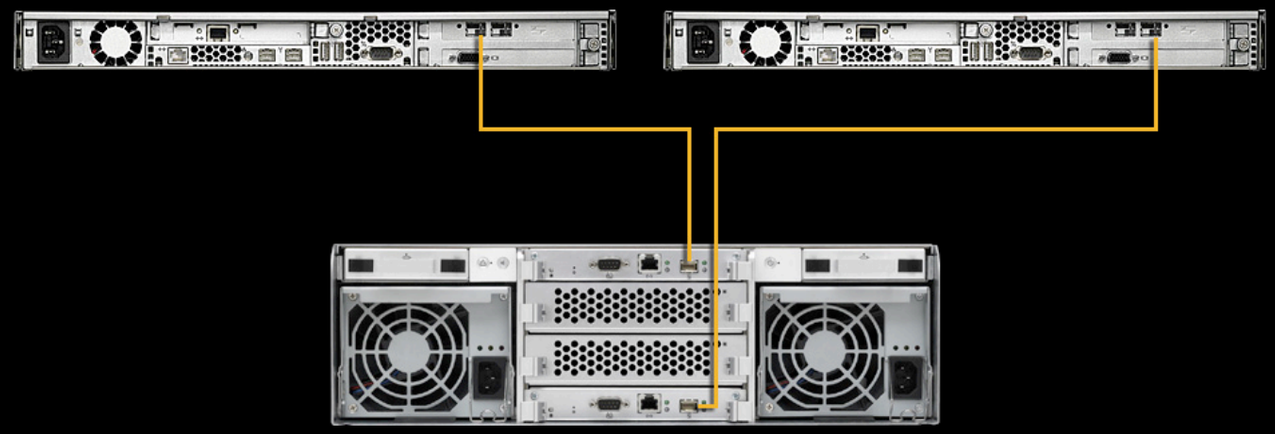
- Hardware components
  - Apple
    - Xserve Server
    - Xserve RAID storage
    - PCI FC Card
- Software
  - Apple RAID Admin
- Configuration
  - Two RAID sets (RAID 5)



Scenario Two

How did we do it?

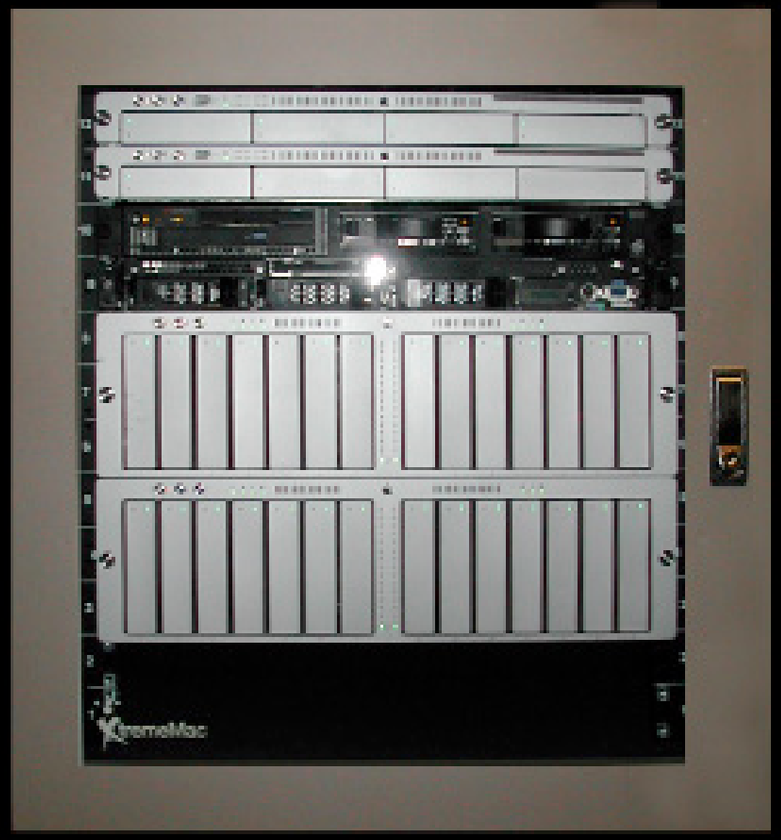
- Hardware components
  - Apple
    - Xserve Server—2
    - Xserve RAID storage
- Software
  - Apple RAID Admin
- Configuration
  - Two RAID sets (RAID 5) One to Each Xserve



Scenario Three

How did we do it?

- Hardware components
  - Apple Xserve
  - IBM x330 Server
  - Dell 1550 Server
  - Apple Xserve RAID
- Software
  - Apple RAID Admin
- Configuration
  - Four RAID sets (three RAID 5, one RAID 1) each server has a RAID 5 set, Xserve has additional RAID 1 boot

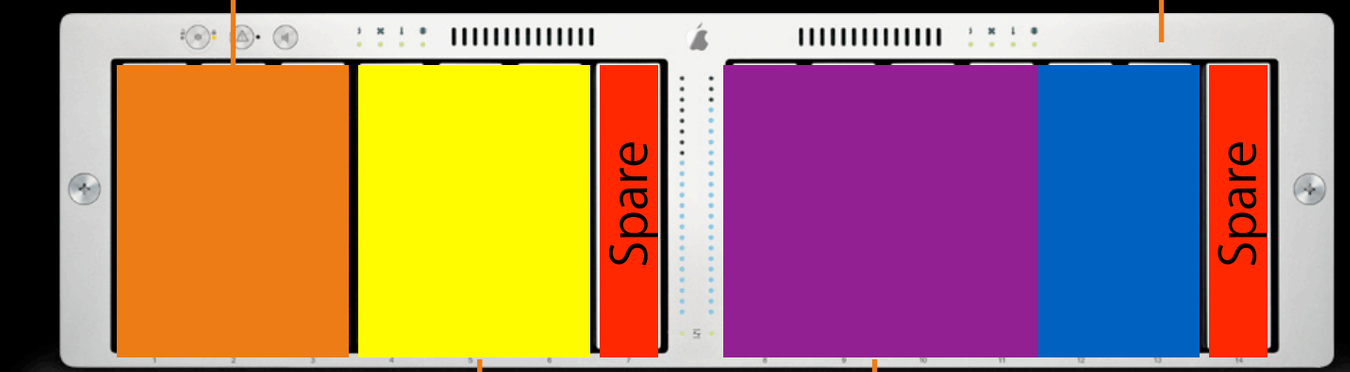


Scenario Three

How did we do it?

RAID Set 1 to Xserve
Usable capacity 360GB

RAID Set 4 Xserve Boot
Usable capacity 180GB



RAID Set 2 to Dell
Usable capacity 360GB

RAID Set 3 to IBM 330
Usable capacity
540GB

Scenario Four—Virtualized Storage

How did we do it?

- Hardware components
  - Apple Xserve—2
  - Apple Xserve RAID—2
  - Vixel 9200 Fibre Channel Switch
  - Chaparral Radar PS
- Software
  - Apple RAID Admin
  - Chaparral RADAR PS—LUN Provisioning engine

Scenario Four—Virtualized Storage

How did we do it?

- Configuration
  - RADAR PS sees 4 RAID sets (4.32TB)
  - RADAR PS allows up 126 LUNs to be provisioned and delivered to up to 126 Servers
    - In this Scenario Each Server has one LUN totaling 2.16TB
    - RADAR PS provides
      - Dynamic growth of LUNs
      - Time/Mark, snapshot and remote replication
    - Add more Xserve RAIDs LUNs growth proportionately
    - Add more servers, LUNs can be re provisioned

Managing LUNs and Performance Tuning With RAID Admin

Sneak Preview RAID Admin

LUN Management

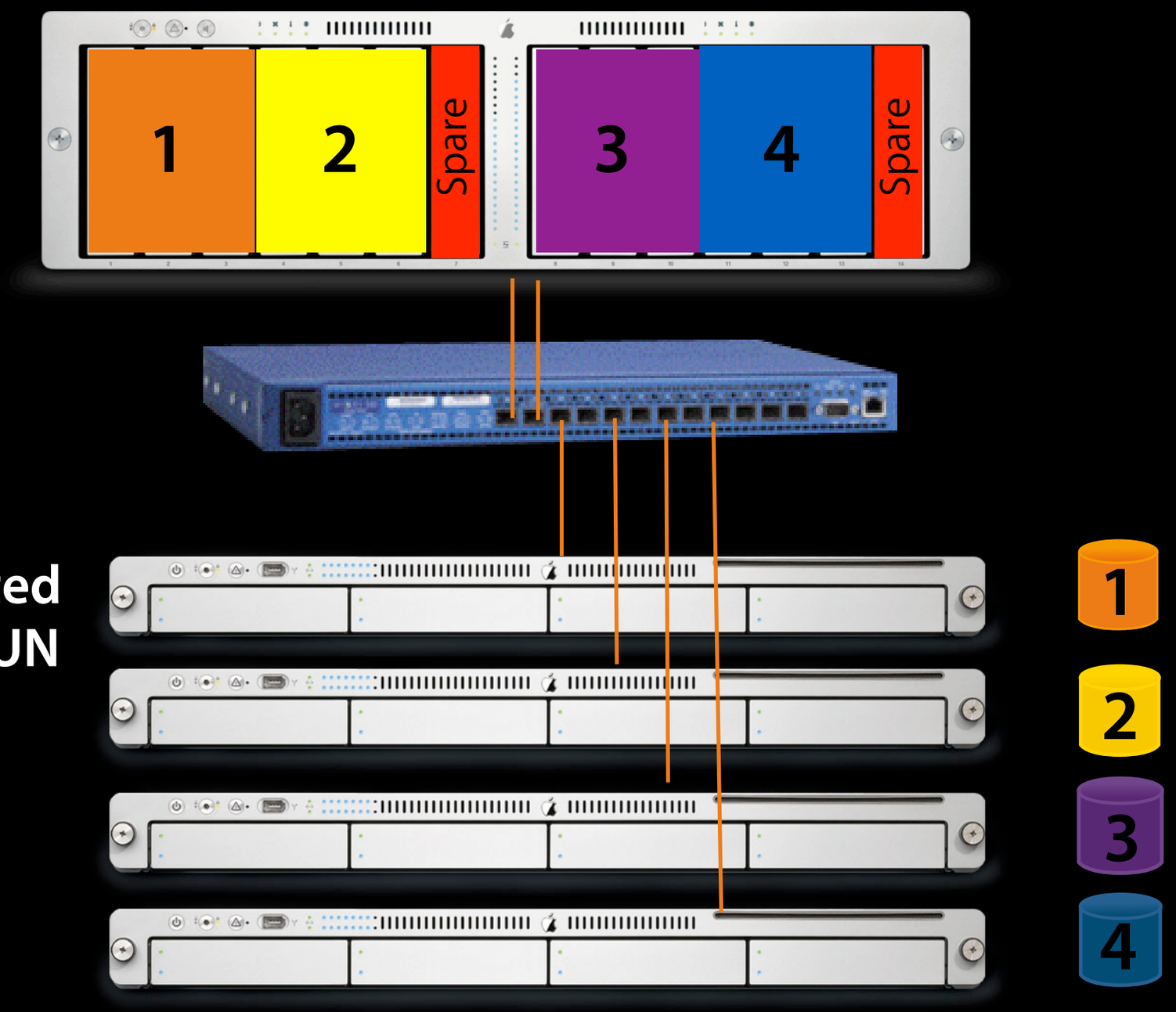
Using RAID Admin

Protected Storage is divided by mapping LUNs to servers

A Fibre Channel Switch provides connection to 4 Xserves

Each Xserve receives a portion of storage dedicated to it called a RAID set or LUN

Each RAID set takes advantage of a shared Global hot spare assigned to each controller



Wrap Up

Top 5 Hints For Deployment

It's as easy as 1, 2, 3... almost

1. Read the Manual
2. Plan Ahead
3. Buy more Storage than you Need
4. Read the Manual Again
5. Number Five—Go Deploy!

Who to Contact

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http://developer.apple.com/wwdc2003/urls.html

For More Information

Reference Library

User Documentation

Xserve RAID User's Guide

Hardware installation, component replacement, general information

Xserve RAID Using RAID Admin and Disk Utility

Instructions for RAID Admin application (PDF on Admin Tools disc)

Online Help

Available from RAID Admin application Help menu

Q&A

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http://developer.apple.com/wwdc2003/urls.html

WWDC 2003

Worldwide Developers Conference